

A Re-evaluation of *Cheilolejeunea* subgenus *Xenolejeunea*

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Summary. *Cheilolejeunea* subgenus *Xenolejeunea* Kachroo & Schust. is emended to account for variability observed in stem anatomy and lobule structure. *Cheilolejeunea* subgenus *Tegulilejeunea* Schust. is reduced to synonymy with subgenus *Xenolejeunea*. A new sectional classification of subgenus *Xenolejeunea* is proposed (sections *Gigantae*, *Meyeniana*, and *Xenolejeunea*). A key distinguishes among the sections and the 10 species accepted in the subgenus, which is known from Australasia, Oceania and tropical Asia. A nomenclator and discussion is provided for each species. Comments on excluded species conclude the treatment .

Kachroo & Schuster (1961) described *Cheilolejeunea* subgenus *Xenolejeunea* for 15 species that previously had been placed in *Pycnolejeunea*. In my work on the Lejeuneaceae of Australia, I have encountered many collections of *Xenolejeunea*, and have found this to be one of the most complex taxa in the flora. In my attempt to sort out the Australian species, I found it necessary to review all of the taxa originally placed in *Xenolejeunea* by Kachroo and Schuster. As a result, I have arrived at some conclusions different from theirs. The purpose of this paper is to present the results of my review of the species placed in subgenus *Xenolejeunea*.

Cheilolejeunea is possibly the second largest genus in the Lejeuneoideae (after *Lejeunea*). The genus is pan-tropical, with some species extending into temperate regions. Schuster (1963, 1980) has been largely responsible for developing the modern concept of the genus. The limits among some subgenera, (especially *Cheilolejeunea*, *Euosmolejeunea* and *Strepsilejeunea*), remain rather vague.

Key to Subgenera of *Cheilolejeunea*

1. Lobules rectangular (2-3 times longer than broad), at least 1/2 lobe length; innovation leaf sequence consistently pycnolejeuneoidsubgenus *Xenolejeunea* Schust.
1. Lobules ovate to oblong (1-1.5x longer than broad), 1/2 or less lobe length; innovation leaf sequence lejeuneoid or pycnolejeuneoid, or innovations absent.....2
2. Leaves flattened, apex rounded.....3
2. Leaves convex, apex bluntly to sharply pointed*Strepsilejeunea* (Spruce) Schust.
3. Proximal lobule tooth 3-5x as long as broad, perianths 5-keeled..... *Cheilolejeunea* Spruce
3. Proximal lobule tooth 1-3x longer than broad, perianths 4-5-keeled..... *Euosmolejeunea* Spruce

The original description of *Cheilolejeunea* subgenus *Xenolejeunea* is somewhat confusing, because the Latin description contradicts the English description in the number of

stem epidermal cell rows, and both the Latin and English descriptions imply that the lobule in all species is a much narrower rectangle than is depicted in their drawings. Because of these discrepancies, and because I have been able to gather data from a broader range of specimens than were available to Kachroo and Schuster, I provide a new description of subgenus *Xenolejeunea*. Data from Kachroo and Schuster is given in square brackets when it differs significantly from mine.

Cheilolejeunea* subgenus *Xenolejeunea

Kachroo & Schust., J. Linn. Soc. 56: 496. 1961.
Type species: *Cheilolejeunea imbricata* (Nees) Steph.

Cheilolejeunea subgenus *Tegulilejeunea*

Schust., Hepat. Anthoc. N. America 4: 853. 1980.
Type species: *Cheilolejeunea excisula* (Steph.) Mizut.

Dioicous. Plants rather robust, main axes 0.7-3 mm wide [1-2.1 mm]. Stems in cross-section with 7-24 epidermal cells surrounding a medulla of 7-40 cells [16-24 epidermal cells in the latin description, 10-44 medullary cells]; epidermal cells differentiated from medullary cells in size and wall thickness in some species; ventral merophytes 2-4 cells broad. Leaves imbricate, flattened to convex, oblong to ovate, rarely broadly ovate; lobules rectangular in outline, rarely ovate, 2-3.5 [3.5] times longer than wide, 0.5-0.75 lobe length, inrolled proximally, flattened distally, distal apex usually with prominent proximal tooth, 1-6 [2-4 or 6-7] cells long, straight or falcate, distal tooth obsolete or present as a broad, blunt projection. Ocelli present or absent, if present, usually arranged in a weakly to strongly defined vitta. Underleaves 1.5-4 times stem width, bifid to 0.3-0.6 underleaf length, lobes erect, triangular or rarely hemispheric, 7-15 cells wide at base, underleaf insertion straight or slightly arched; bases cuneate to rounded, rarely somewhat cordate. Gynoecia on short or long branches, innovations always present, leaf sequence pycnolejeuneoid. Bract lobules present. Perianths basically 4-keeled, reduced fifth dorsal keel present in some species, keels extending 0.6 or

more perianth length. Androecia with 1-2 bracteoles at base.

Schuster (1980) erected *Cheilolejeunea* subgenus *Tegulilejeunea* for *C. excisula* (Steph.) Mizut., which, after examining the holotype, I have found to be a synonym of *C. incisa*, a member of subgenus *Xenolejeunea*. Schuster characterized subgenus *Tegulilejeunea* by the convex nature of the leaves, the long, rectangular lobules, the notched underleaves, and the "presence of bracteoles throughout the androecium." This last character, which Schuster presumably extracted from the type study of *C. excisula* by Mizutani (1967), is apparently incorrect. Gynoecial plants of *C. incisa* occasionally produce spicate vegetative branches with strongly inflated lobules that resemble androecia, and possibly it is these structures that Mizutani interpreted as androecia. According to R. Grolle (pers. comm.), who has studied large quantities of *C. incisa*, the true androecia in this species have bracteoles at the base only. I consider *Tegulilejeunea* a synonym of *Xenolejeunea*, because the lateral leaf and underleaf features used by Schuster as a basis for *Tegulilejeunea* seem rather weak subgeneric characters.

Kachroo and Schuster (1961) proposed a sectional classification for subgenus *Xenolejeunea* based on the structure of the proximal lobule tooth (number of cells in the tooth), the length of the lobule relative to the lobe, stem anatomy (number, wall thickness of cortex, ventral merophyte width) and the presence or absence of a vitta. Their sectional names were not formally described, and thus are nomenclaturally invalid.

I have taken a somewhat different approach to a sectional classification of subgenus *Xenolejeunea*, because I have observed variation within a species, most notably *Cheilolejeunea imbricata*, in some of the characters Kachroo and Schuster used at the sectional level. I retain stem anatomy as a useful feature, although I use it more broadly than Kachroo and Schuster did. Additionally, underleaf structure and the shape of the lobule apex characterize the sections described below. Illustrations of the key features of each section are presented in figures 1-8.

**Preliminary key to the sections and species of
Cheilolejeunea subgenus *Xenolejeunea***

In determining the relative dimensions of the lobules in the following key, I measured the width of the lobules at their midpoint. I made these measurements with the compound microscope using a typical whole-mount preparation. In such a preparation, the lobules are attached to the stem, but compressed slightly due to the pressure from the cover slip. The criterion I used to determine whether or not a lobule apex is acute or attenuate is the extent to which the apex (i.e., the point at which the free margin meets the lobe) extends beyond the basal cell of the proximal lobule tooth. If the apex extends more than 90-100 µm, I characterize it as attenuate.

1. Underleaves obovate, 4-5x stem width, bifid to 0.3 or less of underleaf length..... section Gigantae.. 2
 1. Underleaves orbicular, 1.5-2 times stem width, bifid to 0.5 of underleaf length3
2. Plants 2-3mm wide, stem in cross-section with more than 15 epidermal cell rows, leaf lobules 1-1.5 times longer than broad, free margin weakly inrolled 2. *C. gigantea*
 2. Plants 1-1.5 mm wide, stem in cross-section with 10-15 epidermal cell rows, leaf lobules 2 times longer than broad, free margin distinctly inrolled.....3. *C. incisa*
3. Stems with (7-)10-24 epidermal cell rows, ventral merophytes (2-)4 cells wide; lobule apex attenuate, sinus between lobule tooth and lobule apex straight or sinuous sect. *Xenolejeunea* .. 1. *C. imbricata*
3. Stems with 7(-10) epidermal cell rows, ventral merophyte 2(-4) cells wide; lobule apex acute or truncate at apex, rarely attenuate, sinus between lobule tooth and apex roundedsect. *Meyeniana*4
 4. Dorsal lobes vittate.....5
 4. Dorsal lobes not vittate.....7
5. Vitta narrow (1-2 cells wide), occasionally with secondary ocelli forming short lines or clusters;

- leaf apex acute, rounded to sharply pointed, often reflexed 5. *C. falsinervis*
5. Vitta broader (3-10 cells wide), without separate secondary ocelli; leaf apex broadly rounded, never reflex.....6
 6. Vitta 10 or more cells long, strongly differentiated from other leaf cells; proximal tooth of lobule 1-3(-6) cells long.....10. *C. vittata*
 6. Vitta 4-5 cells long, usually weakly differentiated from other leaf cells, sometimes entirely absent; proximal tooth of lobule (2-)3-6 cells long4. *C. ceylanica*
7. Lobules narrow, 3-3.5 times longer than wide, extending 0.6 or more of leaf length..... 8
 7. Lobules broader, 1.5-2.0 times longer than wide, extending 0.5-0.6 lobe length.....10
8. Lobe apex acute; lobule apex acute6. *C. gardneri*
8. Lobe apex rounded; lobule apex acute or truncate.....9
 9. Lobule teeth rather uniform: proximal lobule tooth distinct, 4-6 cells long, distal lobule tooth indistinct9. *C. meyeniana*
 9. Lobule teeth variable, even on the same plant: proximal lobule tooth 1-3 cells long, distal lobule tooth indistinct or present as a single blunt cell.....8. *C. longiloba*
10. Proximal tooth of lobule free margin 3-6 cells long, distal tooth obsolete, lobule apex truncate.....4. *C. ceylanica*
10. Proximal tooth of lobule free margin 1-3 cells long, often over-arching a single-celled distal tooth, lobule apex acute7. *C. longidens*

***Cheilolejeunea* subgenus *Xenolejeunea* section
*Xenolejeunea***

Cheilolejeunea subgenus *Xenolejeunea* section *Imbricatae* Kachroo & Schust., nom. inval. (Art. 32.1).

Type: *C. imbricata* (Steph.) Hatt.

Stems with (7-)10-24 rows of epidermal cells, ventral merophytes (2-)4 cells wide; lobule apex attenuate; underleaves divided to 0.5 length, underleaves 2X stem width.

1. *Cheilolejeunea imbricata* (Nees) Hatt., Misc. Bryol. Lichenol. 1: 1. 1957. *Jungermannia thymifolia* var. *imbricata* Nees, Enum. Pl. crypt. jav. p. 42. 1830. *Lejeunea imbricata* (Nees) Nees in Gott. et al., Syn. Hepat. p. 359. 1845. *Pycnolejeunea imbricata* (Nees) Schiffn. in Engler & Prantl, Nat. Pflanzenfam. 1, 3: 124. 1893. Type. JAVA, without specific locality, collector or date, "Herb. Nees, herb. Lindenberg 6406" (STR holotype? (not seen), G 16567 isotype).

Cheilolejeunea trapezia (Nees) Kachroo & Schust., J. Linn. Soc., Bot. 56: 509. 1961. *Jungermannia trapezia* Nees, Enum. Pl. crypt. jav. 41. 1830. *Lejeunea trapezia* (Nees) Gott. et al., Syn. Hepat. p. 357-358. 1845. *Pycnolejeunea trapezia* (Nees) Schiffn. in Engler & Prantl, Nat. Pflanzenfam. 1, 3: 124. 1893. Type. Java, "auf Collema bullatum, ex herb. A. Braun" (STR holotype? (not seen), FH-Schiffner 3391 isotype), *syn. nov.*

Pycnolejeunea curvatiloba Steph., Hedwigia 28: 260. 1889, *nom. inval.* (Art. 43); Sp. Hepat. 5: 635. 1914. Type. Norfolk Is., without specific locality, *Robinson s.n.* (G 19897 holotype), *syn. nov.*

Cheilolejeunea tosana (Steph.) Kachroo & Schust., J. Linn. Soc., Bot. 56: 509. 1961. *Pycnolejeunea tosana* Steph., Sp. Hepat. 5: 626. 1914. Type. Japan, Sakawa, Apr 1896, Inoue 63 (G 20604 holotype). Kachroo & Schuster (1960) disagreed with Hattori's (1951) assessment that *C. tosana* was a synonym of *C. imbricata*, because of differences in stem anatomy. However, I agree with Hattori, because the type of *C. tosana* (apparently not seen by Kachroo and Schuster) has a massive stem (18 or more rows of epidermal cells) and a ventral merophyte 4 cells wide, and is very similar to the type of *C. imbricata* in

lobule structure as well.

Kachroo and Schuster (1961) placed *Cheilolejeunea imbricata* and *C. trapezia* in their "section Imbricatae", differentiating it from the others based on stem anatomy, lobular apical tooth structure, and the broad angle between leaf keel and stem, and thus the delimitation is fairly similar to section *Xenolejeunea*, except that Kachroo and Schuster had a much narrower interpretation of the range of stem anatomy in this species. In studying a variety of specimens from throughout the range of *C. imbricata*, I have found that the number of cells in the stem epidermis and the ventral merophyte width vary considerably between primary and secondary branches of the same stem, and among main stems of plants from different geographical regions. Reduced stems (and ventral merophytes) are found commonly at the limits of the range of this species (Japan and Australia). Kachroo and Schuster placed smaller-stemmed forms in a separate species that they called *Cheilolejeuneatosana* (although their concept of this species was erroneous, since it was not based on the type of the species, see nomenclator). However I find no clear hiatus between the extremes; the type of *Pycnolejeunea curvatiloba* and the collection from Mt. Hosie, Australia (MUCV 5884), are both clearly intermediate between the massive-stemmed equatorial Asian and reduced-stemmed, marginally-tropical forms seen in elsewhere in Australia and Japan.

Lobule structure also varies dramatically among collections, and even among leaves on the same plant. The lobule may be broadly to narrowly rectangular (2-3 times longer than wide) and the structure of the lobular tooth may range from a single blunt cell to a well-defined tooth 2-4 cells in length. The distal tooth may be distinct or indistinct. Unlike the variability in stem structure, differences in lobule structure do not appear to correlate with geography. Possibly a biosystematic study of this polymorphic species might yield discernible trends that could be the basis of a varietal classification.

Judging by the number of misdetermined specimens I have examined, *Cheilolejeunea imbricata* is frequently confused with *C. meyeniana*. The differentiation between extreme forms

of these species can indeed be difficult. The relative dimensions of the lobule, and lobule length relative to lobe length in some collections of *C. imbricata* may indeed approach that of *C. meyeniana*. Confusion is particularly great with very robust plants of *C. meyeniana*, which sometimes have up to 10 epidermal cell rows and ventral merophytes 3-4 cells wide. However, when lobule dimensions and the robustness of the stem are not useful for distinguishing such extremes, other characters will probably serve. The epidermal cells will usually be distinctly larger than the medullary cells in *C. meyeniana*, but not or barely larger in *C. imbricata*. Also, the lobule apex is acute or truncate in *C. meyeniana*, but in *C. imbricata* it is always distinctly attenuate.

At the opposite extreme in lobule structure, one collection I examined (Schiffner Iter Indicum 2767) approaches *C. gigantea* in having very broad, weakly inrolled lobules. The plants in this collection are also exceptionally robust. The underleaves, however, are typical for *C. imbricata*.

Cheilolejeunea imbricata has a broad distribution throughout southeast Asia and the islands of the south Pacific.

Representative specimens examined (in addition to types): AUSTRALIA. Queensland: Mt. Lewis, Mareeba, 10 Sep 1985, *Scott s.n.* (MUCV 7380); Kirrama State Forest, Mt. Hosie, 1 Aug 1984, *Stone s.n.* (MUCV 5884); Mt. Elliot, 20 mi S of Townsville, *Fitzalan s.n.* (MEL 630400). New South Wales: E. Ballina, Tree Heath, 16 Jun 1902, *Watts 437* (NSW). INDONESIA. Sumatra: M. Singalang, 24 Jul 1894, Schiffner Iter Indicum 2767 (NY). INDIA. Khasia Mts., [Hooker] 1389 (NY). JAPAN. *Faurie s.n.* (FH); Kiushu: Pref. Fukuoka, Kashimachi, Jun 1951, *Kuwahara 583* (NY). PAPUA NEW GUINEA. Morobe Prov., Bulolo, *Streimann 24978* (NY). PHILIPPINES. Luzon: Benguet Prov., May 1911, *Merrill 7904* (NY).

Cheilolejeunea* subgenus *Xenolejeunea* section *Gigantae B. Thiers, *sect. nov.*

Cheilolejeunea subgenus *Xenolejeunea* section *Incisae* Kachroo & Schust., *nom inval.* (Art. 32.1).

Epiderme caulis 10-20 seriata, merophytis ventralibus latitudine 4-cellularum, lobulis

apice acuto ad acuminato, amphigastriis caule 4-5 latiora, fissura amphigastrio ad 0.1-0.3 longitudinis attingens distinguenda.

Stem epidermis 10-20 seriate, ventral merophytes 4 cells wide; lobule apex acute to acuminate; underleaves 4-5x stem width, underleaves divided 0.1-0.3 of length.

2. *Cheilolejeunea gigantea* (Steph.) Schust. & Kachroo, J. Linn. Soc., Bot. 56: 509. 1961. *Pycnolejeunea gigantea* Steph., Sp. Hepat. 5: 630. 1914. Type. Amboina, *Karsten s.n.* (G 16566 holotype).

Cheilolejeunea gigantea is, as the name implies, a very large plant, easily mistaken at first for a member of Lejeuneaceae subfamily Ptychanthoideae because of the size and the shallow lobing of the underleaves. The differences between this species and *C. incisa* are fairly subtle. In addition to being larger (up to twice as large), *C. gigantea* has a more massive stem, and broader lobules. Both of these species are rather poorly known, and these distinctions may not prove dependable when a broader range of specimens is studied.

Currently *Cheilolejeunea gigantea* is known to me only from Amboina, the type locality, and a recent collection from Papua New Guinea.

Specimen examined (in addition to type): PAPUA NEW GUINEA. Morobe Prov., Mt. Kaindi Rd., near Wau, 19 Aug 1984, *Thiers 3357* (AD, NY).

3. *Cheilolejeunea incisa* (Gott.) Schust. & Kachroo, J. Linn. Soc. Bot. 56: 509. 1960. *Lejeunea incisa* Gott., Syn. Hepat. p. 360. 1845. *Pycnolejeunea incisa* (Gott.) Steph., Sp. Hepat. 5: 624. 1914. Type. Java, collector unknown (holotype destroyed at Berlin?; FH isotype).

Cheilolejeunea excisula (Steph.) Mizut., J. Hattori Bot. Lab. 30: 171-180. 1966. *Pycnolejeunea excisula* Steph., Sp. Hepat. 5: 631. 1914. Type. Java, without specific locality, collector unknown (G 11240 holotype), *syn. nov.*

The greatest variation I have noted among

plants of *Cheilolejeunea incisa* is in perianth structure. Australian plants studied have perianths that are terete throughout almost their entire length (they are weakly plicate only at the apex, figure 8), whereas plants in the type collections of *C. incisa* and *C. excisula* contain plants with distinctly keeled perianths. The significance of this variation is difficult to determine because so few collections of this species are available. However, in other features, the plants examined of this species are rather uniform.

This species is closely related to *C. gigantea*, as discussed under that species. The plant illustrated by Kachroo and Schuster (1961, p. 498, fig. 6-7) is certainly not that species; I was unable to locate the specimen upon which their evaluation and illustration was made. Their plant looks somewhat like *C. ceylanica*, but the lobule apex is rather reminiscent of *C. imbricata*, and so I cannot assign it to one of the species I recognize in subgenus *Xenolejeunea*.

Cheilolejeunea incisa is known from Indonesia, Papua New Guinea, and Australia.

Specimen examined (in addition to types): AUSTRALIA. Queensland: Tully Falls Nat'l. Park, 24 km S of Ravenshoe, mesophyll vine forest, 7 Jul 1984, Thiers & Halling 2299 (AD, NY).

Cheilolejeunea* subgenus *Xenolejeunea* section *Meyenianae* B. Thiers, *sect. nov.

Cheilolejeunea subgenus *Xenolejeunea* section *Ceylanicae* Kachroo & Schust., *nom inval.* (Art. 32.1).

Epiderme caulis 7-10 seriata, merophytis ventralibus latitudine 2-cellularum, lobuli apice acuto ad truncato, amphigastriis caule duplo latiora, fissura amphigastrio ad 0.5 longitudinis attingens distinguenda.

Stem epidermis 7-10-seriate, ventral merophytes 2 cells wide; lobule apex acute to truncate; underleaves 2x stem width, underleaves divided to 0.5 of length.

4. *Cheilolejeunea ceylanica* (Gott.) Schust. & Kachroo, J. Linn. Soc., Bot. 56: 509. 1961.

Lejeunea ceylanica Gott. in Gott. et al., Syn. Hepat. p. 359. 1845. *Pycnolejeunea ceylanica* (Gott.) Schiffn. in Engler & Prantl, Nat. Pflanzenfam. 1, 3: 124. 1895. Type. Ceylon, "inter Rad. boryanum, mis. Hooker" (G 19377 isotype).

Cheilolejeunea verdoornii (Hoffm.) Schust. & Kachroo, J. Linn. Soc., Bot. 56: 509. 1961. *Pycnolejeunea verdoornii* Hoffm., Ann. Bryol. 8: 118. 1935. Type. "Java orient., Res. Pasoeroean, in mm. Tengger, in silvis primigen, in decliv. G. Ajek-Ajek," ca 2100 m, 1930, *Verdoorn s.n.* (JE holotype, FH isotype).

Euosmolejeunea setchellii Pears. in Setchell, Pap. Dept. Mar. Biol. Carnegie Inst. Washington 20: 148. 1924. Type. Samoa, Tutuila Is., Aua-Aofono trail, Jun-Jul 1920, *Setchell 1161a/1277a* (MANCH holotype), *syn. nov.*

Plants studied of *Cheilolejeunea ceylanica* show variation in the length of the proximal lobule tooth, from (2-)3-6 cells long, the shape of the lobule apex (acute or truncate), and the extent to which a weak vitta is developed in the leaf lobe. Mizutani (1980) described *Cheilolejeunea ceylanica* as having vittate leaves, but this condition is far less distinct than in *C. vittata* or *C. falsinervis*.

Depauperate plants of *Cheilolejeunea ceylanica* might be confused with plants of *C. longidens* that bear an elongate proximal apical tooth (2-3 cells long). However, in addition to the proximal tooth, *C. longidens* often has a distal tooth consisting of 1-2(-3) cells, forming a low, shoulder-like projection. Also, the apex of the lobule in *C. longidens* is never truncate. *Cheilolejeunea ceylanica* can also be confused with *C. meyeniana*, if only a limited number of leaves are compared. In my experience, when ten or more leaves are examined, the average lobule dimensions in *C. ceylanica* show a 2-2.5:1 ratio of length to width, and the lobules average 0.5-0.6 of the lobe length. Thus, the lobules in *C. ceylanica* are indeed shorter and broader than in *C. meyeniana* (ratio of lobule length to width 3-3.5:1, lobules 0.6-0.8 lobe length).

Cheilolejeunea ceylanica appears to be a widespread species. It has been reported from Southeast Asia (Thailand), Indonesia, Philippi-

nes, and Japan (Ryukyu Is.) by Mizutani (1980). Additionally, the species is rather common in northern Queensland.

Representative specimens examined (in addition to types): AUSTRALIA. Queensland: Cape Tribulation Nat'l. Park, Noah Head section, 18 Jul 1984, *Thiers & Halling 2631* (AD, NY); Bellenden Ker Nat'l. Park, Mt. Bellenden Ker, central peak, 3 Sep 1988, *Scott s.n.* (MELU 102); Fraser Is., Lake Allom, 29 Aug 1986, *Scott s.n.* (MELU 431, 437, 439). BURMA. Collector unknown (NY). INDONESIA. Java: Mt. Gedeh near Tjibodas Botanical Garden, 1928, *Docters van Leeuwen-Reijvaan s.n.* (NY); Res. Priangan, Sep 1930, *Verdoorn s.n.* (NY, Hepat. Select. & Crit. IX, 438. 1936)

5. *Cheilolejeunea falsinervis* (Sande Lac.) Kachroo & Schust., J. Linn. Soc., Bot. 56: 509. 1961. *Pycnolejeunea falsinervis* (Sande Lac.) Steph., Sp. Hepat. 5: 622. 1914. *Lejeunea falsinervis* Sande Lac., Ned. Kruidk. Arch. 3(4): 420. "1855" (cover). According to Wachter (1937) the actual date of publication is Dec. 1854. Type. Java, "Herb. Junghuhn" (L holotype, FH, NY isotypes). The NY specimen is labelled "Lejeunia falsinervis Lacoste n. sp., Java".

Cheilolejeunea falsinervis is perhaps the most easily recognized species of subgenus *Xenolejeunea* because of the distinct vitta and the acute, incurved leaf apices. The type specimen has no ocelli in the leaves other than those of the vitta, whereas in Australian plants I have seen auxilliary ocelli, singly or in clusters, outside of the vitta area. In his treatment of *C. falsinervis* from the Ryukyu Islands, Mizutani (1978) did not mention auxilliary ocelli in the leaf lobes, but one of his drawings (fig. 3b, p. 124) seems to indicate them. He reported the species as being autoicous, but all the material I have examined appears to be dioicous.

Cheilolejeunea falsinervis is known from Fiji, Japan (Ryukyu Is.), Indonesia, New Guinea, Borneo and Indochina (Vietnam) (Miller 1983), and from Queensland, Australia.

Specimens examined (in addition to type): AUSTRALIA. Queensland: Bellenden Ker Nat'l. Park, summit of central peak of Mt. Bellenden Ker, 10 Jul 1984, *Thiers & Halling 2476* (AD, NY); Lamington Nat'l. Park, Lyre Bird Lookout track, 10 Aug 1981, *Thiers 1192* (NY).

6. *Cheilolejeunea gardneri* (Mitt.) Mizut., J. Hattori Bot. Lab. 26: 181. 1963. *Lejeunea gardneri* Mitt., J. Proc. Linn. Soc., Bot. 5: 115. Type. Ceylon, *Gardner s.n.* (NY holotype).

Cheilolejeunea setifera (Steph.) Schust. & Kachroo, J. Linn. Soc., Bot. 56: 509. 1961. *Pycnolejeunea setifera* Steph., Sp. Hepat. 5: 626. 1914. Type. Philippines, Luzon: Prov. Bataan, Mount Mariveles, Dec 1908, *Merrill 6253* (G 10139 holotype, FH isotype).

Cheilolejeunea gardneri was not treated by Kachroo and Schuster (1961) but is clearly an earlier name for *C. setifera*, which they did include. My examination of the types of *C. gardneri* and *C. setifera* revealed the leaf lobes to be more triangular in outline than in the plant illustrated in Kachroo and Schuster (1961, p. 498, fig. 10, 11).

This species is closely related to *Cheilolejeunea meyeniana*, differing consistently only in leaf shape. I had no material of *C. gardneri* at my disposal aside from the types, but I have studied numerous collections of *C. meyeniana*, and I have never seen a collection of that species with triangular leaves and acute apices, and thus for now I consider *C. gardneri* to be a distinct species.

Currently *Cheilolejeunea gardneri* is known only from Sri Lanka and the Philippines, from the type collections of *C. gardneri* and *C. setifera*.

7. *Cheilolejeunea longidens* (Steph.) Kachroo & Schust., J. Linn. Soc., Bot. 56: 509. 1961. *Pycnolejeunea longidens* Steph., Hedwigia 28: 260. 1889. *nom. inval.* (Art. 43.1). *Pycnolejeunea longidens* Steph., Sp. Hepat. 5: 634. 1914. Type. [Australia,] Queensland, "L. 56" (G 19901 lectotype, designated here). In his first (but invalid) description of this species, Stephani (1889) cited two collections, one as "Queensland, leg. ?" and the other as "Port Denison. leg. Shaw inter Plag. pendulam." The collection G 19901 probably represents the first of these collections. Because it appears to be the only one

in existence, and because it fits the protologue, it is chosen here as lectotype.

Cheilolejeunea micholitzii (Steph.) Kachroo & Schust., J. Linn. Soc., Bot. 56: 509. 1961. *Pycnolejeunea micholitzii* Steph., Sp. Hepat. 5: 627. 1914. Type. Philippines, Mindanao-Siargo, Micholitz s.n. (G 010135 lectotype, designated here); Philippines, Ins. Siargo, *Micholitz s.n.* (G 10134 syntype).

C. deussa Steph. ex Kachroo & Schust., J. Linn. Soc., Bot. 56: 509. 1961. *nom. inval.* (Art. 32.1). Original Material: Gazelle Expedition, collector unknown (FH Schiffner Herbarium sheet 3376).

The epithet of this species is quite misleading, since the length of the proximal lobule tooth is shorter than in most other species of section Meyeniana. The lobule tooth may reach 2-3 cells in robust collections, but in depauperate collections (such as the type of *Pycnolejeunea longidens*) the tooth is only 1-2 cells long. *Cheilolejeunea longidens* may be confused with reduced forms of *C. ceylanica*, as discussed under that species.

Cheilolejeunea longidens has been found in the Philippines, Indonesia, and tropical to subtropical rainforest areas in Queensland.

Specimens examined (in addition to types): AUSTRALIA. Queensland: Goldsborough State Forest Park, 17 km S of Gillies Hwy., 5 Jul 1984, *Thiers & Halling 2159, 2160* (both AD, NY); Noosa Heads Nat'l. Park, 2 Aug 1984, *Thiers 2864* (AD, NY). INDONESIA. Sumatra: "Res. Sum. Westk. G. Singalang," Jul 1894, *Schiffner s.n.* (NY, Hepat. Select. & Crit. IX, 441. 1936, as *Pycnolejeunea micholitzii*).

8. *Cheilolejeunea longiloba* (Steph. ex Hoffm.) Kachroo & Schust., J. Linn. Soc., Bot. 56: 509. 1961. *Pycnolejeunea longiloba* Steph. ex Hoffm., Ann. Bryol. 8: 114. 1935. Type. Philippines, Polillo, Oct-Nov 1909, *McGregor s.n.* (G holotype, NY isotype).

Cheilolejeunea longiloba and *C. meyeniana* differ significantly only in the variability of lobular tooth structure. Although the length of the proximal tooth in *C. meyeniana* varies from

3-5 cells, and the distal tooth is occasionally a distinct, shoulder-like bulge, I have not seen the same amplitude of variation in lobular tooth structure in all the plants I have studied of *C. meyeniana* that I have seen on a single stem of *C. longiloba*. For this reason, *C. longiloba* is maintained as a distinct species, although additional study may show that it is conspecific with *C. meyeniana*.

Cheilolejeunea longiloba is known currently only from Indonesia and the Philippines.

Specimens examined (in addition to the type): INDONESIA. Sumatra: Bukit Nantigo, 1955, *Meijer 9650* (NY). PHILIPPINES. Luzon: subprovince Ifugao, Feb 1913, *McGregor s.n.* (NY).

9. *Cheilolejeunea meyeniana* (Gott., et al.) Schust. & Kachroo, J. Linn. Soc., Bot. 56: 509. 1961. *Lejeunea meyniana* Gott. et al., Nova Acta Acad. Leop. Carol. 19, suppl 1: 472. 1843. *Pycnolejeunea meyeniana* (Gott. et al.) Steph., Sp. Hepat. 5: 628. 1914. Type. Philippines, Manila, "Dr. Karl Mueller ex Herb. Hampe," *Meyen s.n.* (G 16569 isotype).

Pycnolejeunea wattiana Steph. in Steph. & Watts, J. Proc. Roy. Soc. New South Wales 48: 132. 1914. Type. Australia, Lord Howe Is., top of Intermediate Hill, Jul 1911, *Watts 19* (G 19673 lectotype, chosen here), *syn. nov.*

Collections of *Cheilolejeunea meyeniana* differ markedly in the robustness of the plant. The smaller form, represented by the type of the species, has the typical stem structure for section Meyeniana. However, very robust forms (such as the Bass Straits collection) may have 7-10 epidermal cells, and ventral merophytes 3-4 cells wide. The differentiation of such plants from *C. imbricata* is discussed under that species. The dimensions of the lobule, (3-3.5:1) and the length of the lobule relative to the lobe (0.6-0.8 lobe length) are consistent in collections I have studied of *C. meyeniana*, but certain other species (*C. ceylanica*, *C. imbricata* and *C. longidens*) may approach these dimensions. The nature of the lobule apex is somewhat variable in *C. meyeniana*, ranging from acute to truncate. The length of the proximal tooth is variable, as in almost all species

of subgenus *Xenolejeunea*, but most commonly is 3-5 cells long. The distal lobule tooth is occasionally present as a low, shoulder-like projection, and the insertion of the lobule on the stem is weakly to distinctly decurrent. Differentiation of *Cheilolejeunea meyeniana* from *C. ceylanica*, *C. gardneri*, *C. imbricata* and *C. longiloba* is discussed under those species.

Mizutani (1980) described the lobule keel in this species as having a "distinct wing, . . . usually 1 cell wide." But I could not see this feature in my examination of the type. The plant illustrated as *Cheilolejeunea meyeniana* by Kachroo and Schuster (1961) has broader, shorter lobules than are typical for this species.

Cheilolejeunea meyeniana is known from Indonesia (Sumatra, Java), Borneo, Philippines (Mizutani, 1980) and Fiji (Miller et al. 1983) and is reported here from Australia for the first time.

Representative specimens examined: AUSTRALIA. Queensland: Mt. Lewis: 10 Sep 1985, Scott s.n. (MUCV 7386); Millaa Millaa Falls Nat'l. Park, 6 Jul 1984, Thiers & Halling 2551 (AD, NY); Mt. Elliot, 20 mi S of Townsville, Fitzalan s.n. (MEL 630400); Noosa Heads Nat'l. Park, 2 Aug 1984, Thiers 2868 (AD, NY). New South Wales: Lord Howe Is., Mt. Gower, 1979, Lenz s.n. (JE- Eggers AS 2,27). [Tasmania?] Bass Straits, specific locality, collector and date unknown (NY).

10. *Cheilolejeunea vittata* (Steph. ex Hoffm.) Schust. & Kachroo, J. Linn. Soc., Bot. 56: 509. 1961. *Pycnolejeunea vittata* Steph. ex Hoffm., Ann. Bryol. 8: 115-116. 1935. Type. Philippines, Palawan: Lake Manguao, Apr 1913, Merrill 9009 (G 10140 holotype).

Were it not for the consistently strongly developed vitta, *Cheilolejeunea vittata* would be difficult to separate consistently from *C. ceylanica*, because the range in variation of lobule structure in both species overlap one another. On robust plants of *C. vittata* the proximal lobule tooth is 1-6 cells long, and the distal tooth is obsolete. In depauperate plants, however, the proximal tooth is greatly reduced, and the distal tooth is prominent, and may be larger than the proximal tooth.

This species is known from Java, Borneo,

Philippines (Mizutani 1980) and Papua New Guinea (Grolle & Piippo 1984). I have found it rather abundantly in Queensland.

Representative specimens examined (in addition to type): AUSTRALIA. Queensland: Cape Tribulation Nat'l. Park, Noah Head section, 18 Jul 1984, Thiers & Halling 2640 (AD, BRI, NY). Bellenden Ker Nat'l. Park, Fishery Falls, 10 Jul 1984, Thiers & Halling 2540 (AD, NY). INDONESIA. Java: Res. Batavia, Mar 1894, Schiffner s.n. (NY, Hepat. Select. & Crit. IX, 442. 1936)

Excluded Species

Cheilolejeunea cookiensis (Steph.) Schust. & Kachroo, *Pycnolejeunea cookiensis* Steph., Sp. Hepat. 5: 617. 1914. Type. Polynesia, Rarotonga, Cook Is. (G holotype).

Schuster (1980) appears to have transferred this species from subgenus *Xenolejeunea* to subgenus *Euosmolejeunea*. I concur with this transfer; the very short triangular lobules and broadly ovate lobes cordate distal to the lobule insertion precludes placement in *Xenolejeunea*. I also agree with Schuster that this species is distinct from *C. trifaria* (Reinw. et al.) Mizut. (a synonymy suggested by Mizutani 1975), which has a lejeuneoid innovation leaf sequence.

Cheilolejeunea discoidea (Lehm. & Lindenb.) Kachroo & Schust., J. Linn. Soc., Bot. 56: 509. 1961. *Lejeunea discoidea* Lehm. & Lindenb., Syn. Hepat. p. 383. 1845. *Pycnolejeunea discoidea* (Lehm. & Lindenb.) Steph., Sp. Hepat. 5: 612. 1914. Type: St. Vincent (G, NY isotypes).

Cheilolejeunea discoidea is the only new world species originally placed in subgenus *Xenolejeunea* by Kachroo and Schuster. This species does not belong to subgenus *Xenolejeunea* because it is autoicous, the leaves are broadly ovate, the lobules are ovoid rather than rectangular, and the proximal tooth is single-celled. It is better placed in subgenus *Euosmolejeunea*.

Acknowledgements

I gratefully acknowledge the Research Council of the State Herbarium and Botanic Gardens, Adelaide, South Australia (AD), for a grant that supported my field work in Australia in 1984. I thank the curatorial staff of

G, FH, JE, L, MANCH, MELU, and MUCV for specimens sent on loan for this study. I also thank Riclef Grolle for his discussion of *Cheilolejeunea excisula* and *C. incisa*.

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